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FOREST INSECT CONDITIONS IN THE CENTRAL AND SOUTHERN
ROCKY MOUNTAINS AND THE GREAT PLAINS, 1950

Forest Insect Laboratory
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B. H. Wilford, Entomologist

The forest insect problems of the Fort Collins field laboratory of the Division are contained on 101,976,000 acres of forest land within a gross area of 601,647,000 acres; the coordination of surveys of forest insect conditions on those lands is a responsibility of the laboratory.

This area comprises all of the territory within Forest Service Regions 2 and 3 and the plains country of Region 8. Within it are 30 National Forests, 7 National Parks, 29 National Monuments, 1 National Memorial, numerous Indian Reservations, and other federal lands. In addition, there are state, community, and private parks and forest holdings.

Assigned Territory of the Fort Collins Laboratory---1950^{1/}

<u>Forest Service Region</u>	<u>State</u>	<u>Total Area (M acres)</u>	<u>Forest Land (M acres)</u>	<u>Commercial^{2/} Forest Land (M acres)</u>
2	Colorado	66,539	19,902	8,674
	South Dakota	46,766	1,915	1,766
	Wyoming	47,947	6,075	2,060
	Nebraska	49,058	1,112	1,012
	Kansas	<u>52,552</u>	<u>1,121</u>	<u>1,021</u>
		262,862	30,125	14,533
3	Arizona	72,691	19,538	3,147
	New Mexico	<u>77,767</u>	<u>20,001</u>	<u>4,175</u>
		150,458	39,539	7,322
8	Oklahoma	38,250	6,326	0
	Texas	<u>150,077</u>	<u>25,986</u>	<u>240</u>
		<u>188,327</u>	<u>32,312</u>	<u>240</u>
		601,647	101,976	22,095

^{1/} Compilations of data from
Basic Forest Statistics for the United States (as of beginning of 1945),
U. S. Forest Service, July 1946
National Forest Areas, Summary, GPO-O-FS 193, U. S. Forest Service,
June 30, 1950

^{2/} including lands withdrawn from timber use

The objective of forest insect surveys is to collect current information with regard to the occurrence, abundance, and threat of destructive forest insects and to analyze this information at an early date as a primary step in forest protection, as provided under authority of the Forest Pest Control Act. To carry out effectively a survey program, it is important that forest managers and the laboratory personnel report insect conditions as soon as they are observed. These detection reports are a necessary part of a good program. Upon them hinge the decisions for making reconnaissance and subsequent appraisal surveys.

The responsibility of surveying, of necessity, carries with it the obligation to use judgment in deciding job priority so as to accomplish jobs in proper order of importance and time while most effectively and efficiently using the manpower available. Insofar as possible, surveys must be planned for the year. Although the desire is to cover intensively every forest insect situation throughout the area, it has not always been possible to do so.

Limitations in manpower and time, as well as emergency demands caused by unforeseen circumstances requiring a concentration of efforts, may prevent fulfillment of all proposed surveys. As a consequence, the surveys carried out are those judged to be most needed from a national standpoint. A case in point during 1950 was the emergency caused by the Engelmann spruce beetle outbreak in Colorado. The demands created by that outbreak curtailed or otherwise altered work on all of the proposed surveys and necessitated re-planning of the laboratory's overall survey program. The spruce beetle survey itself was intensified in the outbreak area.

Although the survey in the spruce beetle outbreak area was intensified, all other known insect outbreaks and currently reported occurrences of insects were investigated. Of more than passing interest were the Great Basin tent caterpillar, spruce budworm and engraver beetle outbreaks in New Mexico, the report of spruce budworm damage north of the Grand Canyon in Arizona, the bark beetle infestations on the Black Forest, the Rocky Mountain National Park, and the Roosevelt National Forest in Colorado, on the Black Hills and Harney National Forests in South Dakota, and on the Bighorn National Forest in Wyoming, and on private and state lands bordering the Forest. These and others of varying size and importance within the coverage of the Fort Collins laboratory during 1950 are briefly described in the following summary and table 1.

Engelmann Spruce Beetle In Engelmann Spruce

The emergency for large-scale planning for 1950 control of the Engelmann spruce beetle placed an immediate demand for an all-out survey in spruce type. Fortunately, since its inception following the 1939 spruce blow-down in Colorado, the spruce beetle build-up was kept under annual observation. Consequently, the needs on survey were partly predetermined. The greatest handicap to the survey was the dearth of accurate base maps, reliable type maps, and good aerial photographs. The assembling of personnel and equipment

was readily handled; the training of survey personnel was rapid. The plans and details on survey, of necessity, had to develop and change as the job progressed. The survey evolved through steps, all of which could not be foreseen or properly assumed. The result was a technique or procedure that will be described in a forthcoming manual for field use.

The spruce beetle outbreak was limited to three contiguous areas--the White River, Arapaho, and Routt National Forests.

The 1950 coverage was twofold: (1) the spring-early summer survey, and (2) the late summer-fall survey. The first, starting in deep snow, added needed information to the data gathered during the survey of late summer 1949. It tied in directly with the establishment of control camps and ran concurrently with the control operations. The data accumulated on survey was analyzed and immediately turned over to and used by the control camp superintendents.

The late summer-fall survey was begun after 1950 attacks were completed. The results are best given by quoting from W. F. McCambridge's report.^{1/}

"The Engelmann spruce beetle outbreak in Colorado was extended to approximately 1,871,200 more spruce as a result of the 1950 beetle flight. Of this number, 1,546,600 are on 91,730 acres within the considered 1951 control areas Of the total 655,700 are outside of the 1950 control areas . . .

"The 1950 beetle flight has not extended the boundaries of the outbreak any considerable distance over that of last year. Some movement was noted to the north on the Continental Divide and there was some advance to the east No epidemic conditions were found in the Rocky Mountain National Park, and no serious conditions were found on the Roosevelt National Forest."

A small outbreak of the spruce beetle on the Rio Grande National Forest was examined and found to be of endemic proportions. It was concentrated in a readily accessible area where a logging operation was salvaging the timber and reducing the beetle population.

Spruce losses on the Gunnison National Forest, continuous since 1943, have been extensive but the beetle infestation is endemic. The dead timber remains standing and could be salvaged.

No beetle attacks were found in a spring blow-down of spruce on the Uncompahgre National Forest; beetle-attacked spruce and spruce blow-downs are immediately

^{1/} Engelmann Spruce Beetle Outbreak On the National Forests of the Western Slope of Colorado, November 15, 1950

logged out on the Grand Mesa National Forest; and only endemic conditions were observed on the Shoshone and Bighorn National Forests.

Engelmann Spruce Beetle In Lodgepole Pine

Lodgepole pine, not a preferred host of the Engelmann spruce beetle, has been an unlucky victim of its attacks. Within the control areas on the White River, Arapaho, and Routt National Forests, McCambridge found "92,000 lodgepole pine infested by hibernating adults of the 1949 broods." Protection of lodgepole pine from the spruce beetle is dependent upon control of the insect in spruce.

Black Hills Beetle In Ponderosa Pine

As a result of reduced control work on the Roosevelt National Forest during and since World War II, the Black Hills beetle population, which had been reduced to near endemic levels following control efforts in the 7 years prior to 1941, built up to epidemic proportions. An estimated 36,230 trees were successfully attacked in 1950.

As a result of maintenance control since 1946, following little or no control during the war years, the Black Hills beetle situation in the Denver Mountain Parks area and on the Arapaho National Forest has been reduced to an estimated 350 beetle-attacked trees in 1950.

On the Pike National Forest the 1949 efforts to control the Black Hills beetle by treating 8,500 infested trees were apparently effective. The number of 1950 attacks is estimated at 1,800 trees.

The Black Hills beetle is at an epidemic level on the Black Forest. The Black Forest is an area of privately owned land interspersed with some land owned by the State of Colorado. No coordinated attempts have been made to control the insect for several years. However, a fire on the Forest in early 1950 destroyed much of the beetle population. The estimated number of trees attacked in 1950 is 4,000.

Black Hills beetles on the San Isabel, San Juan, and Uncompahgre National Forests are at endemic levels but deserving of maintenance control. A reported build-up of Black Hills beetle occurs on the Great Sand Dunes National Monument. A matter of educating the residents and summer vacationists, especially on the San Isabel, is important. Much of the damage by bark beetles there appears to be tied in with home sites and camping activities. Estimates of 1950 beetle trees on the first three of these areas are 1,000 on the San Isabel, 1,500 on the San Juan, and 750 on the Uncompahgre.

The Black Hills and Harney National Forests illustrate good examples of effective bark beetle control. Through concerted annual efforts since 1948, the outbreak of the Black Hills beetle has been reduced from 53,000 infested trees to an estimated 1,700 1950-attacked trees on the Black Hills and 700 on the Harney.

During the past 4 years the Black Hills beetle population has been building up on the Bighorn National Forest and on private land and land owned by the State of Wyoming adjacent to the Forest. This build-up to an estimated 5,700 ponderosa pines on the National Forest and 29,600 (including 3,200 limber pines) on the adjacent lands is an approximate two to one increase over the 1949 attacks. Unfortunately, the private land owners are not sympathetic to any attempt at controlling the insect either on their own or public owned lands.

Douglas-fir Beetle In Douglas-fir

Douglas-fir in the Rocky Mountain National Park, on the Roosevelt National Forest, and private lands between, were subjected to severe defoliation by spruce budworm from 1938 to 1945. As a consequence, the Douglas-fir beetle built up to epidemic proportions in the years following, reaching a peak in 1948, since when, although no control has been practiced, the outbreak apparently remained static. The estimates of attacks in 1950 are nearly equally divided between the Park and its immediately adjacent private lands, 1,760 trees, and the Forest and its immediately adjacent private lands, 1,700 trees. Nowhere else is the Douglas-fir beetle known to be other than endemic.

Mountain Pine Beetle In Limber and Ponderosa Pines

Mountain pine beetles were apparently at endemic levels in 1950. The 1948-1949 outbreak on the Shoshone National Forest has subsided as a result of natural control factors.

Other Dendroctonus and Ips Species In Pine

An estimated 15,940 ponderosa pines were infested by bark beetles and engraver beetles in 1950 on federal and private lands and lands owned by the State of New Mexico within the bounds of the Lincoln National Forest. The insects apparently have subsided on the Mescalero Apache Indian Reservation. The beetles responsible are the round-headed pine beetle, the Colorado pine beetle, the Cloudcroft ips, Knaus' ips, the Oregon pine engraver, the western six-spined engraver, and the sawtooth pine engraver. Beetle flare-ups have been common during the past 26 years and have generally subsided without artificial control. These flare-ups, however, have resulted in extensive losses. More information is needed regarding the biology of these insects as well as of methods for combating them before sound recommendations on control can be made.

A scattering of an estimated 2,000 ponderosa pines attacked in 1950 by bark beetles and engraver beetles was found at the North Rim of the Grand Canyon National Park. The infestation is of endemic proportions. The Colorado pine beetle, the round-headed pine beetle, the southwestern pine beetle, and several species of engraver beetles are the attacking insects. Attempts at control in 1950 were not very satisfactory. It is interesting to note the apparent absence of the Black Hills beetle.

Other bark beetle infestations of limited size but sources of potential seriousness occur on the Cibola, the Coconino, and the Gila National Forests and on private lands immediately east of the Santa Fe and Carson National Forests. The cause of attacks in the portions of the lands east of the Carson was a build-up of beetles in pines felled along an REA right-of-way. Engraver beetles were attacking pinion on the Mesa Verde National Park following a build-up of the population in pinion along a Park Service pipe-line clearance in the Park.

Fir Engraver Beetle In White Fir

Partly as a result of the spring blow-down in 1950 and partly because of the late start of the 1950 control program, when over 700 trees were treated, the fir engraver beetle population on the Sandias of the Cibola National Forest continues to be a serious threat to the recreational areas. An estimated 600 firs were attacked in 1950. This number includes overturned and broken firs and a few standing trees.

Spruce Budworm On Douglas-fir, Fir, and Spruce

The spruce budworm infestation of Douglas-fir on the Pike National Forest appears to be subsiding naturally. The area of heavy infestation was down to approximately 2,500 acres in 1950 from an approximate 135,000 acres in 1949.

Spruce budworm feeding occurs all along the eastern slope of the Rocky Mountains, in Colorado, often building up and then subsiding without artificial control. One such build-up made itself obvious in 1950 on approximately 51,200 acres of the Rio Grande National Forest.

On the Cibola National Forest the spruce budworm outbreak on 4,800 acres of Douglas-fir and white fir on the Sandias was subjected to aerial spraying with DDT in 1950. The results were very satisfactory. An occasional "miss" of several trees is probable; one spot of a few trees with empty 1950 pupal cases was observed. An estimated 1,000 infested acres at Mount Taylor were not sprayed.

Spruce budworm feeding on spruce, fir, and Douglas-fir occurred in 1950 on approximately 25,000 acres of the Kaibab National Forest and the bordering part of the North Rim of the Grand Canyon National Park. This may be the beginning of a build-up of the budworm.

Spruce budworm infestations on the Santa Fe National Forest are far more extensive than records show and the intensity of continuous infestation in some parts is causing malformation of trees, large losses in growth, and reproduction mortality.

The budworm status on the Carson National Forest may be equal to or near this.

Sawfly On Pine

A sawfly infestation of ponderosa pine on private lands within the Zuni District of the Cibola National Forest has subsided and apparently does not present a serious threat.

Heavy mortality of sawfly larvae on pinion at the Mesa Verde National Park occurred in 1950 during a storm and reduced the infestation markedly.

The sawfly infestation at the Colorado National Monument continues at a moderate level. Natural factors have not reduced it satisfactorily and artificial control in 1950 had not been extensive enough.

Matsucoccus On Pine

The Prescott scale on ponderosa pine at the Grand Canyon National Park has apparently decreased to insignificant proportions as a result of natural factors.

The pinion scale has become more abundant in some areas at the Grand Canyon National Park while in others it has declined. Artificial control efforts have not appeared to be very effective.

At the Colorado National Monument there are individual trees with a heavy population of pinion scale but on the whole the scale is relatively light.

Great Basin Tent Caterpillar On Aspen and Other Hardwoods

Over 280,000 acres of aspen on the Carson and Santa Fe National Forests were infested with the Great Basin tent caterpillar. In 1950 nearly 16,000 acres of federal and private lands were sprayed for control with satisfactory results. These federal lands were of high recreational value. However, there are indications of reinfestation (egg masses) in these latter acres. Hence, the overall acreage has not been reduced. This infestation has been continuous and spreading for the past several years, and tree mortality is beginning to occur. In addition to the injury to the aesthetics, the caterpillar will have material damaging effects on the watershed. This tent caterpillar outbreak extends into private lands east of the two national forests and north into Colorado.

The Great Basin tent caterpillar has severely attacked aspen on approximately 1,500 acres of the Cibola National Forest.

At Mesa Verde National Park tent caterpillars have been causing damage annually to bitter brush and mountain mahogany. This injury is primarily of aesthetic importance.

Fall Webworm On Cottonwoods and Other Hardwoods

A continuing outbreak of the fall webworm at the Bandelier National Monument keeps the cottonwoods and other hardwoods in a near continuous unsightly

condition both as a result of feeding by caterpillars and their persistent webbing. Attempts to control by use of DDT wettable powders applied with a hydraulic rig have not been satisfactory.

Boxelder Bug On Boxelder

The boxelder bug has been very annoying at the Bandelier National Monument as much a result of its habits of invading tourists' quarters as its damage to boxelder.

Alder Flea Beetle On Alder

This pest of alder has been causing light damage to alder foliage at Bandelier National Monument.

Loopers On Walnut and Willow

At Carlsbad Caverns National Park a looper has been defoliating walnut and willow. The injury is of considerable aesthetic importance.

Miscellaneous

Terminal kill of ponderosa pine on the Coconino National Forest needs investigation before a report on the cause can be made.

Possible increases in abundance of a twig borer on pinion on the Cibola National Forest and a twig borer on juniper on parts of the Cibola and Coconino National Forests have promoted limited inquiries by the forest officials.

Forest Insect Control Projects

A listing of the forest insect control projects carried out during 1950 within the territory of the Fort Collins laboratory is given in table 2.

Table 1

FOREST INSECT CONDITIONS IN CENTRAL AND SOUTHERN ROCKY MOUNTAINS AND THE GREAT PLAINS - 1950

General Area	Locality	Insect	Host	Infestation Status (Acres)	Status (Trees)	Suggested Action
<u>Colorado</u>						
White River N.F.	Eagle)	Engelmann	Engelmann	91,730	1,546,600	ODB ^{1/} or EDB ^{2/} treatment
Arapaho N.F.	Kremmling)	spruce	spruce			
Routt N.F.	Rabbit Ears)	beetle				
Routt N.F.	South U.S. 40	"	"	64,000	324,600	None
		"	Lodgepole pine	91,730	92,000	Limited ODB or EDB treatment
Rio Grande N.F.	Wolf Cr. Pass	"	Engelmann spruce		500	Salvage & ODB treatment
Gunnison N.F.	Curecanti Cr.	"	"	Undetermined		Salvage
Roosevelt N.F.	Red Feather	Black Hills beetle	Ponderosa pine	10,314	20,460	ODB or EDB treatment
	Poudre	"	"	8,597	14,170	"
	Estes Park	"	"		500	"
	Boulder	"	"		1,100	"
Denver Mtn. Parks) Arapaho N.F.)	Evergreen	"	"		350	"
Pike N.F.	Bailey	"	"		300	"
	South Platte	"	"		1,000	"
	Devil's Head	"	"		250	"
	Lake George	"	"		250	"

General Area	Locality	Insect	Host	Infestation Status (Acres)	(Trees)	Suggested Action
Black Forest		Black Hills beetle	Ponderosa pine		4,000	Log & burn slabs & ODB or EDB treatment
San Isabel N.F.	San Carlos Spanish Peaks	"	")		1,000	ODB or EDB treat- ment
San Juan N.F.	Dolores Glade	"	")		1,500	"
Uncompahgre N.F.	Hanks Valley Sandborn Park	"	")		750	"
Rocky Mtn. N.P.	Estes Park	"	"		150	"
		Douglas-fir beetle	Douglas- fir		1,760	ODB treatment
Roosevelt N.F.	"	"	"		1,700	"
Mesa Verde N.P.		Ips spp.	Pinion	Scattered trees and slash along right of way		Slash disposal
Pike N.F.	Cheeseman Lake	Spruce budworm	Douglas- fir	2,500 Moderate to heavy defoliation		None
Rocky Mountains (eastern slope)		"	"	Light defoliation		"
Rio Grande N.F.	Del Norte	"	"	51,200 Moderate to heavy defoliation		"
Mesa Verde N.P.		Sawfly	Pinion	Scattered trees, light defoliation		DDT mist-blower (if insect flares up)

General Area	Locality	Insect	Host	Infestation Status (Acres) (Trees)		Suggested Action
Colorado N.M.		Sawfly	Pinion	Scattered trees, light to moderate defoliation		DDT mist-blower
		Matsucoccus	"	Scattered trees, light damage		None
Mesa Verde N.P.		Great Basin tent cater- pillar	Bitter brush Mountain mahogany	Scattered trees, moderate defolia- tion		DDT mist-blower
<u>Wyoming</u>						
Shoshone N.F.	Little Warm Springs Cr.	Engelmann spruce beetle	Engelmann spruce	3,800	very few	None
	Rattlesnake Mtn.	Mtn. Pine beetle	Lodgepole pine	1,900	"	"
Bighorn N.F.	Rock Cr.	Black Hills beetle	Ponderosa pine	350	5,700	"
	Muddy-Billy Creeks	"	" Limber pine)	4,000	26,400 3,200	" "
<u>South Dakota</u>						
Black Hills N.F.	Limestone) Rochford) Spearfish)	Black Hills beetle	Ponderosa pine		1,700	ODB & EDB treatment
Harney N.F.	Moon Camp	"	"		700	"
<u>New Mexico</u>						
Lincoln N.F.	James Canyon	Dendroctonus & Ips spp.	"	1,242	4,910	To be deter- mined

General Area	Locality	Insect	Host	Infestation Status (Acres)	Status (Trees)	Suggested Action
	Cox Canyon	Dendroctonus & Ips spp.	Ponderosa pine	586	4,020	To be deter- mined
	Russia Canyon	"	"	684	6,610	"
	Perk Canyon	"	"		400	"
Cibola N.F.	General	"	"	Scattered trees		"
Coconino N.F.	"	"	"	"		"
Gila N.F.	"	"	"	"		"
Santa Fe N.F.	"	"	"	"		"
Carson N.F.	"	"	"	"		"
Cibola N.F.	Sandia	Fir engraver beetle	White fir		600	Fell & burn or ODB treatment
		Spruce budworm	White fir & Douglas-fir	4,800		Treated 1950
	Mt. Taylor	"	Spruce, Douglas-fir, and Fir	1,000 Moderate defoliation		DDT aerial spray
Santa Fe N.F.	General	"	"	Light to heavy de- foliation		"
Carson N.F.	"	"	"	Light defoliation		Nene
Cibola N.F.	Sandia	Twig borer	Pinion	Moderate injury		"
		"	Juniper	"		"

General Area	Locality	Insect	Host	Infestation Status		Suggested Action
				(Acres)	(Trees)	
	Zuni	Sawfly	Ponderosa pine	Light defoliation		DDT mist-blower (if insect flares up)
	Mt. Taylor	Great Basin tent caterpillar	Aspen	1,500 Moderate to heavy defoliation		DDT mist-blower
	Sandia	Twig borer	Juniper	Moderate injury		None
		"	Pinion	"		"
Carson N.F.	Taos	Great Basin tent caterpillar	Aspen	195,800 Heavy defoliation		DDT aerial & mist-blower
Santa Fe N.F.	Pecos	"	"	88,300 Heavy defoliation		"
Lands north and east of Carson & Santa Fe N.F.		"	"	Heavy defoliation		"
Bandelier N.M.		Fall webworm	Cottonwood, etc.	"		DDT aerial
		Boxelder bug	Boxelder	Moderate defoliation		None
		Flea beetle	Alder	Light defoliation		"
Carlsbad Caverns N.P.		Looper	Walnut & willow		250	DDT mist-blower

General Area	Locality	Insect	Host	Infestation Status (Acres)	Status (Trees)	Suggested Action
<u>Arizona</u>						
Kaibab N.F.	Kaibab Lodge	Spruce budworm	Spruce, fir) Douglas-fir)	25,000		None
)	Light to moderate defoliation		
)			
)			
)			
Grand Canyon N.P.	North Rim Lookout	"	"			
	Walhalla Plateau	Dendroctonus & Ips spp.	Ponderosa pine	15,000)	2,000	ODB or EDB treatment
	Swamp Lake	"	"	12,000)		
	South Rim	Pinion scale	Pinion	40		No satisfactory method of con- trol known
				Light to heavy damage		
Cape Royal	Cape Royal	Prescott scale	Ponderosa pine	25		None
				Light "stag- horning"		
Coconino N.F.	Lake Mary	Unknown	"	Scattered trees terminal injury		"
	Bonito Flat	Twig borer	Juniper	Moderate injury		"
<u>Nebraska</u>						
Nebraska N.F.	Bessey	Turpentine beetle	Ponderosa, Scotch, jack, and Austrian pine	500	300	No satisfactory method of con- trol known
	Plantations	Tip moth	Ponderosa pine	Light to heavy distribution		"

1/ ODB - orthodichlorobenzene
2/ EDB - ethylene dibromide

Table 2

MAJOR FOREST INSECT CONTROL PROJECTS IN CENTRAL AND SOUTHERN ROCKY MOUNTAINS AND THE
GREAT PLAINS - 1950

General Area	Control Agency	Insect	Host	Control Method	Accomplishments (Acres)	(Trees)
<u>Colorado</u>						
White River N.F. Arapaho N.F. Routt N.F.	U.S. Forest Service	Engelmann spruce beetle	Engelmann spruce	Standing trees treated with ODB	33,301	784,082
Rio Grande N.F.	"	"	"	" and sanitation-salvage		300
Pike N.F.) Arapaho N.F.) Denver Mtn.) Parks)	(U.S. Forest Service (Denver Mtn. Parks	Black Hills beetle	Ponderosa pine	Standing trees treated with ODB		212
Roosevelt N.F.	U.S. Forest Service	"	"	Standing trees treated with EDB	3,300	5,241
Rocky Mtn. N.P.	National Park Service	"	"	Standing trees treated with ODB	11,526	(118
		"	Limber pine	")	(4
Colorado N.M.	"	Sawfly	Pinion	Mist-blower	14 pounds DDT	
<u>South Dakota</u>						
Black Hills N.F.	U.S. Forest Service	Black Hills beetle	Ponderosa pine	Standing trees treated with ODB) 350,000	(5,047
	Homestake Mining Co.	"	"	")	(403
Harney N.F.	U.S. Forest Service	"	"	")	(384

General Area	Control Agency	Insect	Host	Control Method	Accomplishment: (Acres) (Trees)	
<u>New Mexico</u>						
Cibola N.F.	U.S. Forest Service	Fir engraver beetle	White fir	Felled trees treated with ODB	1,500	720
	"	Spruce budworm	White fir & Douglas-fir	Aerial spray DDT solution	4,800	
Carson N.F.	"	Great Basin tent caterpillar	Aspen	"	14,108	
Santa Fe N.F.	"	"	"	"	1,500	
Bandelier N.M.	National Park Service	Webworm	Cottonwood, etc.	Hydraulic rig DDT emulsion	10	
	"	Flea beetle	Alder	"	Scattered trees	
	"	Boxelder bug	Boxelder	"	15	
Carlsbad Caverns N.P.	"	Looper	Walnut, willow, etc.	DDT spray	320	
<u>Arizona</u>						
Grand Canyon N.P.	National Park Service	Pinion scale	Pinion	Dendrol-nicotine sulphate spray	32	5,765
	"	Dendroctonus & Ips spp.	Ponderosa pine	Felled trees treated with ODB		12
<u>Nebraska</u>						
Nebraska N.F.	U.S. Forest Service	Turpentine beetle	Scotch, jack pine	Standing trees treated with ODB & DDT	36,000	303